

IN THE CLAIMS:

Claim 1 (Currently Amended): A mounting arrangement, comprising:

a fuel rail;

a fuel injector cup connected to the fuel rail, the fuel injector cup having a fuel communication area defining a longitudinal axis, a fuel rail mounting section, and a retaining surface;

a fuel injector including a fuel metering end and a fuel outlet end, the fuel inlet end being exposed to the communication area; and

CI a fastener that ~~secures the fuel injector to the fuel injector cup and~~ (1) allows the fuel injector to reciprocate along the longitudinal axis of the fuel injector cup and to limit reciprocation of the fuel injector along the longitudinal axis in a direction toward the fuel injector cup and away from the fuel injector cup, the fastener having a wall and a pair of legs projecting from the wall, the pair of legs straddling both the fuel injector cup and fuel injector, the legs and wall each having a respective length along the longitudinal axis, the length of the wall being less than the length of each leg, and (2) secures the fuel injector to the fuel injector cup during an environmental vibration test that includes, while vibrating the mounting arrangement for a minimum of 15 hours in a longitudinal, lateral, and vertical direction at varying frequencies no greater than 600 Hz sinusoidal, subjecting the mounting arrangement to at least: (1) a thermal cycle test over a range of approximately -40 to 140°C; and (2) a pressure cycle test of at least 30,000 cycles over a range of approximately 0 to 1500 kPa.

Claim 2 (Original) The mounting arrangement of claim 1, wherein the fuel injector cup comprises a cylindrical tube, the fuel rail mounting section being located at a first end of the tube, the retaining surface being located at a second end of the tube; and wherein the fuel injector comprises a housing having a retention groove.

Claim 3 (Previously Presented) The mounting arrangement of claim 2, wherein each leg of the fastener comprises a tab and a window, the tab having a mating surface that engages the

retention groove of the fuel injector housing, the window having a frame that engages the retaining surface of the fuel injector cup.

Claim 4 (Original) The mounting arrangement of claim 3,

wherein the retaining surface comprises a lip located at the second end of cylindrical tube, the lip extending away from the longitudinal axis;

wherein the frame comprises a pair of landing edges configure so that, when the fuel injector is located at a first position along the longitudinal axis, the lip of the fuel injector cup engages one of the landing edges, and when the fuel injector is located at a second position along the longitudinal axis, the lip of the fuel injector cup engages the other of the pair of landing edges.

Claim 5 (Original) The mounting arrangement of claim 4,

wherein the retention groove comprises a channel that partially encircles the housing of the fuel injector, the channel including a first end and a second end;

wherein each of the tabs on each of the legs include a stop that abuts the first end and the second end of the channel, respectively, to constrain relative rotation between the fuel injector and the fuel injector cup.

Claim 6 (Previously Presented) The mounting arrangement of claim 5, further comprising an air induction device having an aperture, the metering end of the fuel injector comprising a face seal that mates with the aperture when the fuel injector is located at one of the first position and the second position along the longitudinal axis.

Claim 7 (Previously Presented) The mounting arrangement of claim 6, wherein the mounting arrangement comprises a production assembly having the fastener installed by an automated process, the production assembly being capable of satisfying at least an appropriate assembly integrity test and environmental vibration test.

Claim 8 (Currently Amended) A mounting arrangement, comprising:

a fuel rail;

a plurality of fuel injector cups connected to the fuel rail, each of the fuel injector cups including a cylindrical tube defining a longitudinal axis, a fuel rail mounting section disposed at a first end of the tube, and a lip at a second end of the tube;

a plurality of fuel injectors, each fuel injector corresponding to one of the plurality of fuel injector cups, each fuel injector having a housing including a fuel metering end, a fuel inlet end, and a retention groove, the fuel inlet end of the fuel injector being disposed within the cylindrical tube of the fuel injection cup; and

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a clip that engages both the lip of the fuel injector cup and the retention groove in the housing of the fuel injector to secure the fuel injector to the fuel injector cup and allow the fuel injector to reciprocate along the longitudinal axis extending through the cylindrical tube of the fuel injector cup, the clip limiting reciprocation of the fuel injector along the longitudinal axis in a direction toward the fuel injector cup and away from the fuel injector cup, the clip having a wall and a pair of legs projecting from the wall, the pair of legs straddling both the fuel injector cup and fuel injector, the legs and wall each ~~having~~ consisting of a respective length along the longitudinal axis, the longest length of the entire wall being less than the length of each leg. ✓

Claim 9 (Original) The mounting arrangement of claim 8, wherein the clip comprises a wall and a pair of legs projecting from the wall, the pair of legs straddling both the fuel injector cup and fuel injector, each leg having with a tab and a widow, the tab having a mating surface that engages the retention groove in the housing of the fuel injector, the window having a frame that engages the lip of the fuel injector cup, the frame having a pair of landing edges extending along the corresponding leg, the pair of landing edges on the frame configured so that, when the injector is located at a first position along the longitudinal axis, the lip of the fuel injector cup engages one of the landing edges, and when the injector is located at a second position along the longitudinal axis, the lip of the fuel injector cup engages the other of the pair of landing edges.

Claim 10 (Original) The mounting arrangement of claim 9,

wherein the mounting arrangement comprises a production assembly having the clip installed by an automated process;

wherein the production-assembly is capable of satisfying at least an appropriate assembly integrity test and environmental vibration test.

Claim 11 (Currently Amended) ~~The An assembly mounting arrangement of claim 10,~~
comprising:

a fuel rail;

a plurality of fuel injector cups connected to the fuel rail, each of the fuel injector cups including a cylindrical tube defining a longitudinal axis, a fuel rail mounting section disposed at a first end of the tube, and a lip at a second end of the tube;

a plurality of fuel injectors, each fuel injector corresponding to one of the plurality of fuel injector cups, each fuel injector having a housing including a fuel metering end, a fuel inlet end, and a retention groove, the fuel inlet end of the fuel injector being disposed within the cylindrical tube of the fuel injection cup; and

a clip that engages both the lip of the fuel injector cup and the retention groove in the housing of the fuel injector to secure the fuel injector to the fuel injector cup and allow the fuel injector to reciprocate along the longitudinal axis extending through the cylindrical tube of the fuel injector cup, the clip limiting reciprocation of the fuel injector along the longitudinal axis in a direction toward the fuel injector cup and away from the fuel injector cup, the clip having a wall and a pair of legs projecting from the wall, the pair of legs straddling both the fuel injector cup and fuel injector, the legs and wall each having a respective length along the longitudinal axis, the length of the wall being less than the length of each leg;

wherein the clip comprises a wall and a pair of legs projecting from the wall, the pair of legs straddling both the fuel injector cup and fuel injector, each leg having with a tab and a widow, the tab having a mating surface that engages the retention groove in the housing of the fuel injector, the window having a frame that engages the lip of the fuel injector cup, the frame having a pair of landing edges extending along the corresponding leg, the pair of landing edges on the frame configured so that, when the injector is located at a first position along the

longitudinal axis, the lip of the fuel injector cup engages one of the landing edges, and when the injector is located at a second position along the longitudinal axis, the lip of the fuel injector cup engages the other of the pair of landing edges;

wherein the clip is installed by an automated process;

wherein the assembly is capable of satisfying at least an appropriate assembly integrity test and environmental vibration test;

wherein the assembly integrity test includes: (1) an air leakage test in which the production assembly must have an air leakage rate of no greater than 2.5 cc/min when the production assembly is pressurized to no greater than 600 kPa; and (2) a liquid immersion test in which the production assembly when at a stable pressure of no greater than 500 kPa and submerged in a test fluid for 30 seconds no bubbles appear in the test fluid; and

wherein the environmental vibration test includes, while vibrating the production assembly for a minimum of 15 hours in a longitudinal, lateral, and vertical direction at varying frequencies no greater than 600 Hz sinusoidal, subjecting the production assembly to at least: (1) a thermal cycle test over a range of approximately -40 to 140°C; and (2) a pressure cycle test of at least 30,000 cycles over a range of approximately 0 to 1500 kPa.

Claim 12 (Canceled)

Claim 13 (Canceled)

Claim 14 (Currently Amended) ~~The A clip of claim 13;~~ for securing a fuel injector to a fuel injector cup on a fuel rail, the fuel injector having a housing disposed along a longitudinal axis with a retention groove, and the fuel injector cup having a lip, the clip comprising:

a wall having a first end and a second end, the wall having a length disposed along the longitudinal axis;

a first leg projecting from the first end of the wall, the first leg including a first tab and a first window, the first leg having a length disposed along the longitudinal axis; and

a second leg projecting from the second end of the wall, the first leg and the second leg being substantially parallel, the second leg including a second tab and a second window, the second leg having a length disposed along the longitudinal axis;

wherein the length of the wall is less than the length of the first or second legs;

wherein the first tab and the second tab have a corresponding mating surface configuration adapted to engage the retention groove in the housing of the fuel injector;

wherein the first window and the second window each have a substantially similar frame adapted to engage the lip of the fuel injector cup, each of the frames having a pair of landing edges extending along the corresponding leg, the pair of landing edges on each of the frames being spaced so that engagement of one of the landing edges with the lip of the fuel injector cup is exclusive of engagement of the lip of the fuel injector cup with the other of the landing edges so that the one of the landing edges limits the reciprocation of the fuel injector along the longitudinal axis in the direction toward the fuel injector cup and the other one of the landing edges limits reciprocation of the fuel injector along the longitudinal axis in the direction away from the fuel injector cup;

wherein the frame of each of the legs further includes a pair of side edges between the landing edges so that the frame has a substantially rectangular configuration; and

wherein the frame of each of the legs further includes a pair of side edges between the landing edges, each of the side edges having a length approximately half the length of one of the landing edges.

Claim 15 (Currently Amended) A method of mounting a fuel injector to a fuel injector cup on a fuel rail so that the fuel injector is secured to the fuel injector cup and the fuel injector can be positioned along a longitudinal axis defined by the fuel injector cup, the method comprising:

providing a fuel rail with at least one fuel injector cup, the at least one fuel injector cup including a retaining surface;

locating at least one fuel injector proximate the at least one fuel injector cup, the at least one fuel injector having a housing with a retention groove; and

securing the at least one fuel injector to the at least one fuel injector cup with a fastener that engages both the retention surface of the fuel injector cup and the retention groove in the

housing of the fuel injector, the fastener limiting reciprocation of the fuel injector along the longitudinal axis in a direction toward the fuel injector cup and away from the fuel injector cup, the fastener having a wall and a pair of legs projecting from the wall, the pair of legs straddling both the fuel injector cup and fuel injector, the wall and each leg ~~having~~ consisting of a length disposed along the longitudinal axis, the longest length of the entire wall being less than the length of each leg.

16. (Original) The method of claim 15, further comprising:

providing a lip on the fuel injector cup as the retaining surface and a channel partial encircling the housing of the fuel injector as the retaining groove; and

provide a metal clip as the fastener, the clip comprising a wall and a pair of legs projecting from the wall, the pair of legs straddling both the fuel injector cup and fuel injector, each leg having with a tab and a window, the tab having a mating surface that engages the channel in the housing of the fuel injector, the window having a frame that engages the lip of the fuel injector cup, the frame having a pair of landing edges extending along the corresponding leg, the pair of landing edges on the frame configured so that, when the fuel injector is located at a first position along the longitudinal axis, the lip of the fuel injector cup engages one of the landing edges, and when the fuel injector is located at a second position along the longitudinal axis, the lip of the fuel injector cup engages the other of the pair of landing edges.

17. (Original) The method of claim 16, further comprising:

installing the clip with an automated process so that the at least one fuel rail, the at least one fuel injector, and the clip comprise a production assembly capable of satisfying at least an appropriate assembly integrity test and environmental vibration test.

18. (Original) The method of claim 1⁷, further comprising:

providing an air induction device having an aperture so that a face seal on a metering end of the fuel injector mates with the aperture when the fuel injector is located at one of the first position and the second position along the longitudinal axis.